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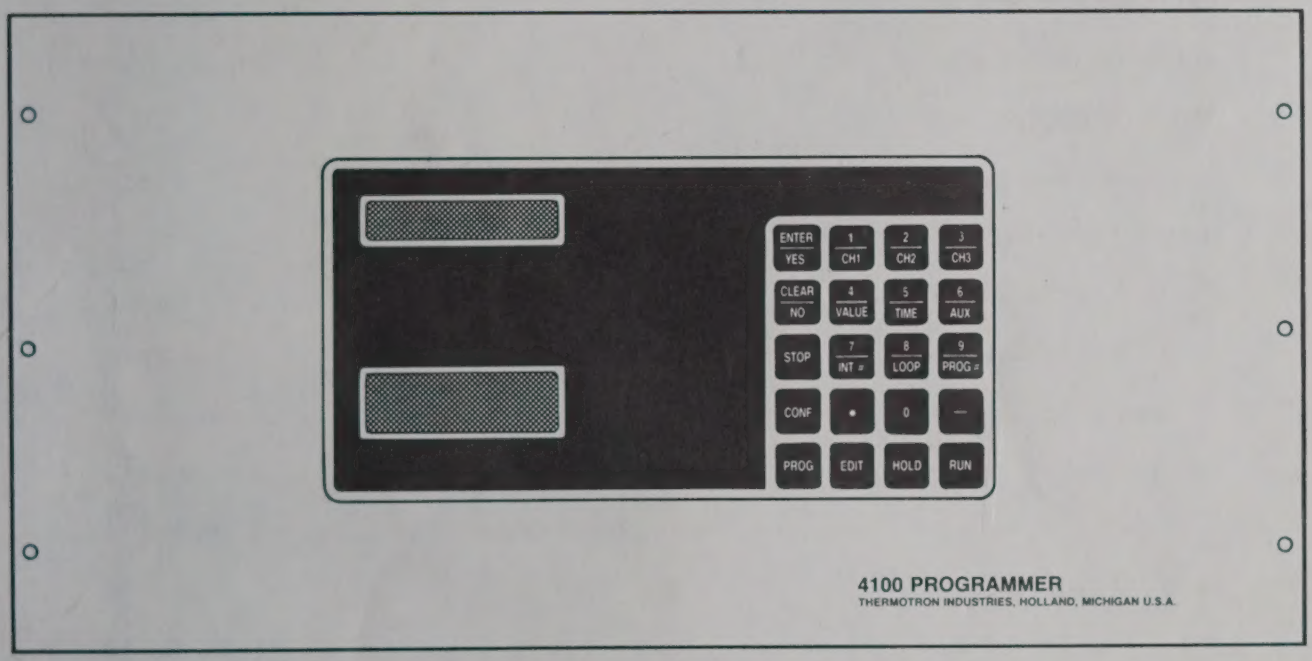

This manual has important information for the safe operation of this instrument. Read this manual carefully and tell all operators to read this manual. If you do not follow the instructions, you can cause an injury or damage to the equipment, the product, and the building.

4100 PROGRAMMER

OPERATOR MANUAL

For new manuals contact:

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4100 PROGRAMMER OPERATOR MANUAL
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SAFETY INSTRUCTIONS

For the safe operation of this instrument, read and understand all warnings and cautions. Look for these symbols:

⚠ **WARNING:** **If you do not follow the instructions in a WARNING, injury can occur to you or to other personnel.**

⚠ **CAUTION:** **If you do not follow the instructions in a CAUTION, damage can occur to the equipment.**

⚠ 1. You must have training in the operation of this instrument before using it. **Read the instruction manual.**

⚠ 2. Do not operate this instrument unless it is completely assembled.

⚠ 3. Maintenance and repairs must be done by authorized personnel only. Make calibrations according to the specifications given in this manual.

⚠ 4. Use a mild soap and water solution to clean the control panel of the instrument.

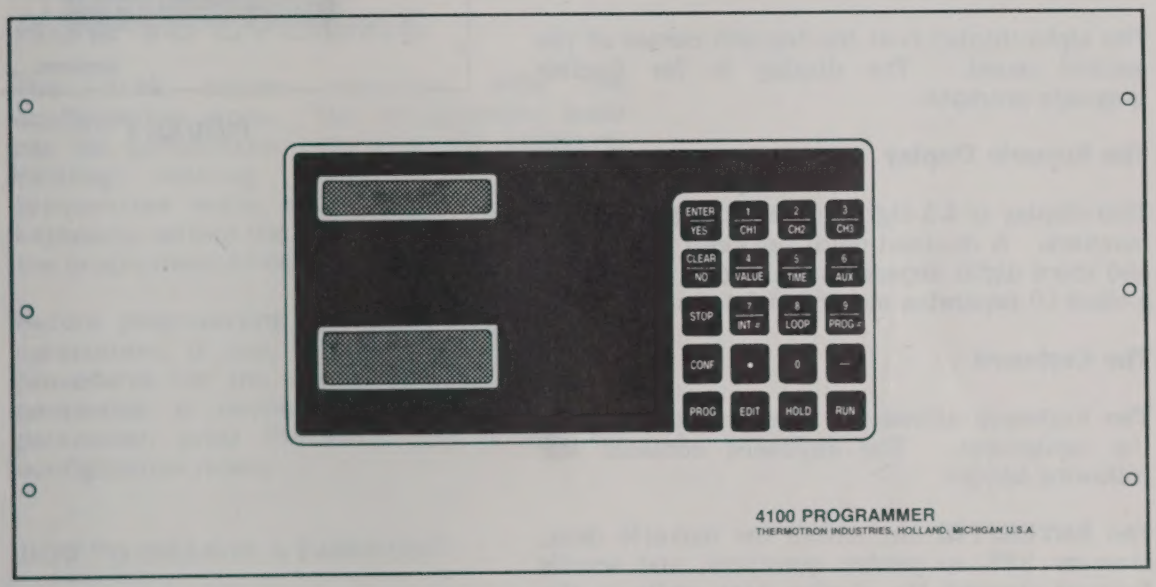
⚠ 5. To prevent electrical shock, do not touch the transformer leads and the power terminals marked L and N.

⚠ 6. To prevent damage to the instrument, do not connect AC power to the terminal blocks on the display module.

⚠ 7. Always use an electrical supply system with a separate electrical ground conductor. For maximum protection against electrical shock, use a circuit that is protected by a ground fault circuit interrupter.

SPECIFICATIONS

OPERATING TEMPERATURE:	$0^{o}C$ to $50^{o}C$ ($32^{o}F$ to $122^{o}F$).
POWER REQUIREMENTS:	117 volts AC, 50/60 hertz.
CHANNELS:	Up to three independently programmable channels.
TEMPERATURE RANGE:	$-87^{o}C$ to $+191^{o}C$ ($-125^{o}F$ to $+375^{o}F$).
OPTIONAL RANGE:	Ranges and inputs available for other variables.
TEMPERATURE SCALE:	Celsius or Fahrenheit, keyboard selectable.
PROGRAM ENTRY:	20 character membrane type keyboard.
DISPLAYS:	16 character alphanumeric and 4.5 digit liquid crystal display.
OUTPUT:	Standard—0-5 volts DC, optional—matched to controller input requirement.
EVENT OUTPUTS:	Eight on/off, TTL compatible programmed in each interval, or manually.
STORAGE TEMPERATURE:	$-20^{o}C$ to $+70^{o}C$.
MAXIMUM INTERVAL LENGTH:	199 hours.
LOOPS:	Up to 100 loops per program. Each loop can be repeated 255 times. Nesting of loops allowed.
INPUT:	Type "T" thermocouple, direct % relative humidity, or linear 0 to 100.
INTERVALS:	Depends on number of channels.
PROGRAMS:	Up to 10. Intervals can be divided between programs.



4100 PROGRAMMER

The 4100 Programmer is specifically designed for use with Thermotron chambers. It is a microprocessor instrument which provides an analog signal for automatic control of setpoint versus time profiles. The 4100 features a keyboard, an alpha display for English language prompts, and a numeric display for data.

THE CONTROLS

THE CONTROL PANEL

The control panel contains the alpha display (1), the numeric display (2) and the keyboard (3). The control panel is mounted on the console. See Figure 1.

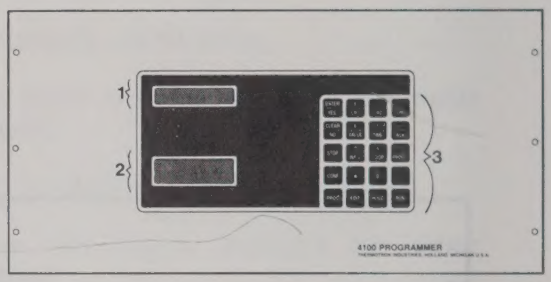


FIGURE 1

The Alpha Display

The alpha display is at the top left corner of the control panel. The display is for English language prompts.

The Numeric Display

This display is 4.5 digit light emitting diodes for numbers. A decimal point between the second and third digits separates hours and minutes or a slash (/) separates months and days.

The Keyboard

The keyboard allows the operator to program the equipment. The keyboard contains the following key(s):

The **ENTER/YES** key enters the numeric data, answers YES to yes/no questions, and scrolls forward through the display data while in the RUN, HOLD, and STOP modes.

The **CLEAR/NO** key clears the last numeric entry, answers NO to yes/no questions, and scrolls backwards through the display data while in the RUN, HOLD, and STOP modes.

The **STOP** key stops the functions of the 4100. It is also used to stop the program and the set-up modes.

The **CONF** key is used to delete programs, to lock/unlock the keyboard, to set the date and time, to set the temperature scale, and to allow calibration. The configuration mode is entered from STOP.

The **PROG** key starts the program mode. The program mode is entered from STOP.

The **HOLD** key holds a running program.

The **EDIT** key changes programs from STOP. The edit mode can change values from HOLD.

The **RUN** key starts a program from STOP or HOLD.

The **0** through **9** keys, the **.** key, and the **-** key are for numeric input and the selection of the data to be displayed in the STOP, RUN, or HOLD modes.

HOW TO OPERATE

The 4100 begins operation with the configuration mode. The configuration mode has six parameters: changing the password, deleting existing programs, setting the temperature scale, locking and unlocking the keyboard, setting the date and time, and setting the programmer to calibrate.

Before programming can begin, decide which parameters, if any, are needed. Follow the procedures for the desired parameter. If no parameter is needed or at the end of a parameter, press the **STOP** key to exit the configuration mode.

HOW TO CHANGE A PASSWORD

The 4100 Programmer is shipped with a password of 0. Passwords can be any number from 0 to 9999. If the correct password is not used, the programmer returns to STOP.

To change a password, follow this procedure:

1. Press the **CONF** key. The alpha display shows CONFIGURE MODE for one second. The alpha display then shows ENTER PASSWORD.

2. Press the appropriate numeric key(s) for the password.

3. Press the **ENTER** key. The alpha display shows CHANGE PASSWORD?.

4. If no change is desired, press the **NO** key.

Continued on the next page.

5. If a change is desired, press the **YES** key. The alpha display shows NEW PASSWORD?. The numeric display shows the current password.

6. Press the appropriate numeric key(s) for the new password.

7. Press the **ENTER** key. The alpha display shows DELETE PROGRAM?.

8. To delete a program follow the procedures on Page 17, **How to Delete a Program.**

9. If a program does not need to be deleted, press the **NO** key.

HOW TO RECOVER A LOST PASSWORD

If the password for the programmer is not available, the programmer will have to be reset.

To reset the programmer, follow this procedure:

1. Disconnect the main power supply.

2. Locate the microcomputer module on the back of the 4100.

   a. If the 4100 is in a console, go to the back of the console. Partially remove the two screws that hold the door to the console. Open the door.

⚠ **CAUTION: To prevent damage to the 4100, support the 4100 while removing the last screw. Slowly move the 4100 from the console. Do not pull the wiring.**

   b. If the 4100 is on a chamber, remove five of the six screws, from the front of the 4100. Support the 4100 while removing the last screw. The wiring for the 4100 has approximately one foot of slack. Do not pull the wiring.

   c. If the 4100 is in its own box on the chamber, open the door.

3. Remove JB1 from the microcomputer module. See Figure 2.

4. Wait 5 minutes.

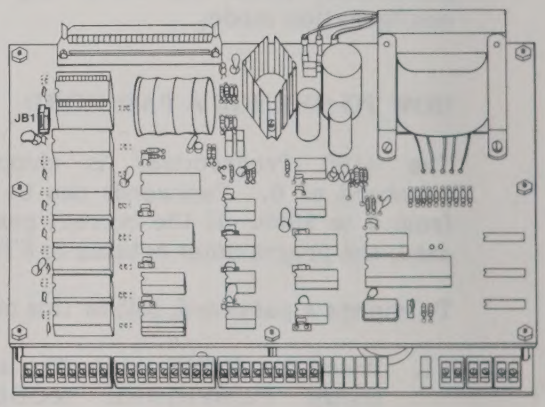


FIGURE 2

5. Replace JB1 as shown in Figure 3.

6. Connect the main power supply. The password is now 0.

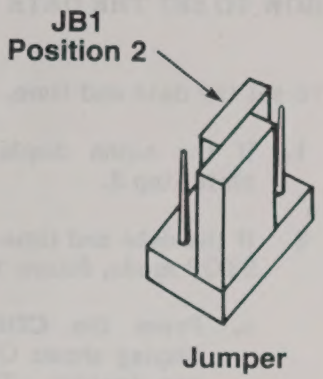


FIGURE 3

HOW TO SET THE TEMPERATURE SCALE FOR FAHRENHEIT OR CELSIUS.

To set the temperature scale for either Fahrenheit or Celsius, follow this procedure:

1. If the alpha display shows SET TEMP SCALE, omit Step 2.

2. If the temperature scale is to be changed from the STOP mode, follow this procedure:

   a. Press the **CONF** key. The alpha display shows CONFIGURE MODE for one second. The alpha display then shows ENTER PASSWORD.

   b. Press the appropriate numeric key(s) for the password.

   c. Press the **ENTER** key. The alpha display shows CHANGE PASSWORD?.

   d. Press the **NO** key. The alpha display shows DELETE PROGRAM?.

   e. Press the **NO** key. The alpha display shows SET TEMP SCALE?.

3. Press the **YES** key to display the current temperature scale.

4. Press the **CLEAR** key to display the alternate temperature scale.

5. When the desired scale is displayed, press the **ENTER** key. The alpha display shows CHANGE LOCK?.

6. To change the status of the keyboard, follow the procedures on Page 22 and 23, **How to Lock the Keyboard.**

7. If the status of the keyboard does not need to be changed, press the **NO** key.

HOW TO SET THE DATE AND TIME

To set the date and time, follow this procedure:

1. If the alpha display reads SET DATE?, omit Step 2.

2. If the date and time are to be set from the STOP mode, follow this procedure:

   a. Press the **CONF** key. The alpha display shows CONFIGURE MODE for one second. The alpha display then shows ENTER PASSWORD.

   b. Press the appropriate numeric key(s) for the password. Press the **ENTER** key. The alpha display then shows CHANGE PASSWORD?.

   c. Press the **NO** key. The alpha display shows DELETE PROGRAM.

   d. Press the **NO** key. The alpha display shows SET TEMP SCALE.

   e. Press the **NO** key. The alpha display shows CHANGE LOCK?.

   f. Press the **NO** key. The alpha display shows SET DATE?.

3. If the date is correct, press the **NO** key. The alpha display shows SET TIME XX:XX?. Omit Steps 4 through 6.

4. If the date is incorrect, press the **YES** key. The alpha display shows MONTH?. Press the appropriate numeric key(s) for the correct month. Press the **ENTER** key. The alpha display shows DAY?.

5. If the day is incorrect, press the appropriate numeric key(s) for the correct day. Press the **ENTER** key. The alpha display shows SET TIME?.

6. If the day is correct, press the **ENTER** key. The alpha display shows SET TIME?.

7. If the time is correct, press the **NO** key. The alpha shows CALIBRATE?.

8. If the time is incorrect, press the **YES** key. The alpha display shows HOUR?. Press the appropriate numeric key(s) for the correct hour. Press the **ENTER** key. The alpha display shows MINUTE?.

9. If the minute(s) are wrong, press the appropriate numeric key(s) for the correct minute(s). Press the **ENTER** key. The alpha display shows CALIBRATE?.

10. To calibrate, see Page 24, 25 and 26, **How to Calibrate the 4100.**

11. If the 4100 does not need to be calibrated, press the **NO** key.

HOW TO ACTIVATE THE CHANNELS ON TWO AND THREE CHANNEL UNITS

All 4100 programmers have two channels. Only specially ordered 4100 programmers have three channels. 4100 programmers bought with a chamber are pre-set to ordered specifications. Your 4100 programmer can have channels that were not activated at the factory.

To activate unused channels, follow this procedure:

1. Press the **CONF** key. The alpha display shows CONFIGURE MODE for one second. The alpha display then shows ENTER PASSWORD.

2. Press the **−** key and the numeric **4**, **1**, **0**, and **0** keys. Press the **ENTER** key.

3. The alpha display reads SET TEMP SCALE?. Press the **YES** key.

4. Press the **CLEAR** key to display the alternate temperature scale.

5. When the desired scale is displayed, press the **ENTER** key. The alpha display shows HOW MANY CHANNEL?.

6. Enter the required number of channels. Press the **ENTER** key. The alpha display shows WRITING EEROM for one second.

Continued on the next page.

WAS 169

7. The alpha display reads CH1 OUTPUT TYPE?. The types available are:
   a. Type 1 - Temperature ^{O}F or ^{O}C
   b. Type 2 - Direct % RH
   c. Type 3 - Linear 0 to 100

8. Enter 1, 2, or 3 for the type of output. Press the **ENTER** key.

9. The alpha display reads CH1 RANGE LOW?. Press the appropriate numeric key(s) for the low setpoint range. Press the **ENTER** key.

10. The alpha display reads CH1 RANGE HIGH?. Press the appropriate numeric key(s) for the high setpoint range. Press the **ENTER** key.

11. The alpha display reads CH1 PROG LOW?. Press the appropriate numeric key(s) for the low program range. This range can not be lower than the low setpoint range. Press the **ENTER** key.

12. The alpha display reads CH1 PROG HIGH?. Press the appropriate numeric key(s) for the high program range. This range can not be higher than the high setpoint range. Press the **ENTER** key.

13. The alpha display reads CH1 DEFAULT SP?. Press the appropriate numeric key(s) for the default setpoint. Press the **ENTER** key.

NOTE: The default setpoint is also the initial value for programming. This value is usually ambient.

14. Repeat Steps 8 through 13 for each channel.

15. The alpha display reads POWER FAILURE LIMIT for one second. The standard setting for the power failure limit is 5 seconds.

16. The alpha display shows HOW MANY DAYS?. Press the appropriate numeric key(s). Press the **ENTER** key.

17. The alpha display shows HOW MANY HOURS?. Press the appropriate numeric key(s). Press the **ENTER** key.

18. The alpha display shows HOW MANY MINUTES?. Press the appropriate numeric key(s). Press the **ENTER** key.

19. The alpha display shows HOW MANY SECONDS?. Press the **5** key. Press the **ENTER** key.

20. The unit goes to the STOP mode.

HOW TO PROGRAM

The 4100 Programmer has storage for ten different programs. The programs are numbered 1 through 10.

HOW TO ENTER A NEW PROGRAM

To enter a new program, follow this procedure:

1. Put the unit in the STOP mode. Press the **PROG** key. The alpha display shows the number of intervals that can be programmed. If there are not enough intervals, press the **STOP** key. To acquire more memory, see Page 17, **How to Delete a Program.**

2. Press the **ENTER** key. The alpha display shows PROGRAM #?. The 4100 selects the lowest available program number.

NOTE: The program number displayed or any number from 1 to 10 can be entered as long as a program with that number does not exist.

3. Press the appropriate numeric key(s) for the desired program number. Press the **ENTER** key. The alpha display shows CH1 INIT VALUE?. Press the **ENTER** key. The initial value is usually room temperature.

NOTE: For units with two channels, the alpha display shows CH2 INIT VAL?. Press the **ENTER** key. For units with three channels the alpha display shows CH3 INIT VAL?. Press the **ENTER** key.

Continued on the next page.

4. The alpha display shows INTERVAL #?.

5. Press the **ENTER** key. The alpha display shows CH1 FINAL VAL?.

6. The final value is the same as the initial value unless a change is needed. If no change is needed, omit Steps 7 and 8. Press the **ENTER** key.

7. To make the needed change, press the appropriate numeric key(s) for the new final value. Press the **ENTER** key.

8. The alpha display shows CH1 RAMP?. Press the appropriate numeric key(s) for the ramp rate. Press the **ENTER** key. If the ramp rate is something other than 0, omit Steps 9 through 12.

9. The alpha display shows HOW MANY HOURS?. Press the appropriate numeric key(s) for the hours needed to ramp. Press the **ENTER** key.

10. The alpha display shows HOW MANY MINS?. Press the appropriate numeric key(s) for the minutes needed to ramp.

11. Press the **ENTER** key.

12. For 4100 with either two or three channels, repeat Steps 6 through 11.

13. The alpha display shows AUX. OUTPUTS?. To program the auxiliary outputs, press the numeric key(s) 1 through 8.

14. Press the **CLEAR** key to cancel the auxiliaries.

15. When the correct auxiliaries are ON (a "leg" extending), press the **ENTER** key. The alpha display shows NEXT INTERVAL?.

16. If looping is desired, see Pages 13 and 14, **How to Program Looping.**

17. If looping is not desired, press the **ENTER** key. To continue programming, repeat Steps 4 through 17.

18. To stop programming, press the **STOP** key. The alpha display shows PROGRAM SUMMARY?.

19. To review or edit a program, press the **YES** key. For more information see Page 14 through 16, **How to Review a Program** and **How to Edit a Program.**

20. If reviewing or editing a program is not desired, press the **STOP** key.

HOW TO PROGRAM LOOPING

Looping is sending a program back to a previous interval or target interval. The final value must be the same as the target value for a smooth transition rate in the chamber.

If looping is desired while programming the 4100, follow this procedure:

1. When the alpha display shows NEXT INTERVAL?, press the appropriate numeric key(s) to indicate which interval is the target interval for the loop. Press the **ENTER** key.

2. The following rules apply when looping:

   a. The target interval must be less than or equal to the current interval. See Figure 4.

   b. The target interval must not be within any other loop unless it is the target for that loop. See Figure 4.

   c. Loops can be nested. The maximum number of loops per program is 100.

   d. An interval may loop to itself and may be the target of another loop. See Figure 4.

3. When a loop is programmed, the alpha display shows NUMBER OF LOOPS?. Press the appropriate numeric key(s) for the number of loops needed. Press the **ENTER** key. A loop can be repeated 255 times.

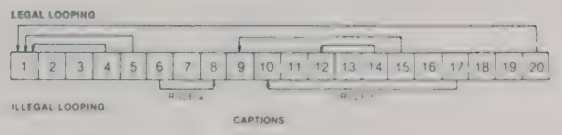


FIGURE 4

Continued on the next page.

NOTE: If an illegal loop is requested, the alpha display shows NEXT INTERVAL? and the number of the interval the programmer is on.

To continue programming, see Pages 11, 12 and 13, **How to Enter a New Program.**

HOW TO REVIEW OR EDIT A PROGRAM

A program can be reviewed or edited from the prompt PROGRAM SUMMARY?, from the STOP mode, or from the HOLD mode.

HOW TO REVIEW A PROGRAM

To review a program, follow this procedure:

1. If the **STOP** key is pressed at the end of programming, the alpha display shows PROGRAM SUMMARY?.

2. To review the entire program interval by interval, press the **YES** key.

3. To scroll through the program, press the **ENTER** key.

4. To correct a value, press the appropriate numeric key(s) for the new value. Press the **ENTER** key.

HOW TO EDIT A PROGRAM FROM STOP

If, after programming, there is no desire to review the program and the **NO** key is pressed, any changes to the program require using the **EDIT** key. The program is entered into the memory of the 4100. The edit mode may be stopped at any time by pressing the **STOP** key.

To edit a program from STOP, follow this procedure:

1. Press the **EDIT** key. The alpha display shows PROGRAM #?.

2. Press the appropriate numeric keys for the number of the program to be edited.

3. Press the **ENTER** key. The alpha display shows INTERVAL #?.

4. There are three ways to edit intervals; alter an interval, insert an interval, or delete an interval.

   a. To alter an interval, follow this procedure:

      1. Press the appropriate numeric key(s) for the interval that needs to be changed. Press the **ENTER** key.

      2. The alpha display shows ALTER INTERVAL?.

      3. To scroll through the interval in the same order as when programming, press the **YES** key. To change the values in the interval, press the appropriate numeric keys. Press the **ENTER** key.

   b. To insert an interval, follow this procedure:

      1. Press the appropriate numeric key(s) for the interval that is before the interval to be inserted.

      2. Press the **ENTER** key. The alpha display shows ALTER INTERVAL?.

      3. Press the **NO** key. The alpha display shows INSERT INTERVAL?.

      4. Press the **YES** key. The alpha display shows the new interval to be programmed.

      5. Follow Steps 5 through 14, on Page 12, **How to Enter a New Program.** The 4100 renumbers the remaining intervals correctly.

   c. To delete an interval, follow this procedure:

      1. Press the appropriate numeric key(s) for the interval to be deleted.

Continued on the next page.

2. Press the **ENTER** key. The alpha display shows ALTER INTERVAL.

3. Press the **NO** key twice. The alpha display shows DELETE INTERVAL.

NOTE: If a mistake is made, push the **STOP** key. Begin at Step 1 on Page 14, **How to Edit a Program from Stop.**

4. Press the **YES** key.

HOW TO EDIT A PROGRAM FROM HOLD

If temporary changes are needed while a program is running, use the Edit from Hold procedure.

To edit from hold, follow this procedure:

1. Press the **HOLD** key.

2. There are two ways to select a value to be changed.

   a. Press the **ENTER** key to scroll forwards. Press the **CLEAR** key to scroll backwards.

   OR

   b. Use the assigned function key.

3. Press the **EDIT** key. Make the necessary changes.

NOTE: Not all values can be edited. For more information, see Pages 21 and 22, **How to Edit Values While Running a Program.** If the value can not be edited, the 4100 returns to HOLD.

4. Press the **ENTER** key. The 4100 returns to the interval shown in the alpha display.

5. Press the **RUN** key to continue the program.

HOW TO DELETE A PROGRAM

To delete a program, follow this procedure:

1. If the alpha display shows DELETE PROGRAM?, omit Step 2.

2. Put the 4100 in the STOP mode. To delete a program(s), follow this procedure:

   a. Press the **CONF** key. The alpha display shows CONFIGURE MODE for one second. The alpha display then shows ENTER PASSWORD.

   b. Press the appropriate numeric key(s) for the correct password.

   c. Press the **ENTER** key. The alpha display shows CHANGE PASSWORD?.

   d. Press the **NO** key. The alpha display shows DELETE PROGRAM?.

   e. Press the **YES** key. The alpha display shows PROGRAM #?.

3. Press the appropriate numeric key(s) for the number of the program to be deleted.

NOTE: To delete all programs, press the numeric **0** key when the alpha display shows PROGRAM #?.

4. Press the **ENTER** key. The alpha display shows DELETE #?.

5. Press the **ENTER** key.

HOW TO RUN A PROGRAM

The 4100 can be run in either the programmed setpoint mode or in the manual setpoint mode.

To run a program in the programmed setpoint mode, follow this procedure:

1. Put the 4100 in the STOP mode. Press the **RUN** key.

2. The alpha display shows PROGRAM #?.

Continued on the next page.

3. To run a previously entered program, press the appropriate numeric key(s) for the number of the desired program. Press the **ENTER** key.

   a. The alpha display shows INTERVAL #?. The numeric display shows 1. Press the appropriate numeric key(s) for the desired interval.

   b. The alpha display shows DELAYED START?.

      1. If the **NO** key is pressed, the program starts immediately.

      2. If the **YES** key is pressed, the alpha display shows SET DATE? To set the date and time, follow Steps 4 through 11 on Pages 8 and 9. Start can be delayed up to a year minus 1 hour.

4. To run the 4100 in the manual setpoint mode, press the **RUN** key. When the alpha display shows PROGRAM #?, press the **0** key.

   a. The alpha display shows MANUAL MODE for one second. The alpha display then shows CH1 FINAL VAL ^{o}F/C?. The numeric display shows the current value.

   b. Press the appropriate numeric key(s) for the new final value. Press the **ENTER** key.

   c. The alpha display shows CH1 RAMP?. Press the appropriate numeric key(s) for the ramp rate. Press the **ENTER** key.

   d. The alpha display shows AUX. OUTPUTS?. To program the auxiliary outputs, press the numeric key(s) 1 through 8.

   e. For 4100 with either two or three channels, repeat Steps b and c.

   f. To stop the manual mode, press the **STOP** key.

Continued on the next page.

NOTE: If the manual mode prompting process is started and the **STOP** key is pressed, the values for the manual mode must be finished. The 4100 then returns to the STOP mode.

HOW TO READ THE ALPHA AND NUMERIC DISPLAYS

When the 4100 is in either the run mode or the hold mode, the data for the current interval can be shown in the alpha and numeric displays. When the 4100 is in the stop mode, some of the data shown refers to the last interval that was run.

Data is shown in groups. To show the data, follow this procedure:

1. Put the 4100 in either the stop mode, the run mode, or the hold mode. Press the appropriate numeric key(s) to select the group. To determine which numeric key to press, see Step 7 on Pages 20 and 21.

2. Press the same numeric key again to scroll forward within the selected group.

3. Press the numeric **1** key to display the Channel 1 data.

   For units with two channels, press the numeric **2** key to display the data for Channel 2. For units with three channels, press the numeric **3** key to display the data for Channel 3.

4. The last letter in the alpha display means the following:

   F means degrees in Fahrenheit

   C means degrees in Celsius

   The third character in the alpha display indicates which channel.

   Example: CH1 FINAL VAL C means the channel 1 final value is in degrees Celsius.

5. The data groups and their sequence are on Page 20. The appropriate numeric key is also given.

Value Group **Numeric key 4**

CH# RAMP °/MIN - The change of degree per minute is displayed.

CH# RAMP %/MIN - The humidity change per minute is displayed. The value is only on humidity chambers with direct relative humidity programming.

CH# SET POINT - The current setpoint for each channel is displayed.

CH# INIT VAL - The initial value of the setpoint for this interval is displayed. This is also the final value of the previous interval.

CH# FINAL VAL - This is the final value of the setpoint for this interval.

Time Group **Numeric key 5**

REMAINING TIME - This is the time remaining for this interval.

INTERVAL TIME - This is the programmed interval time.

TIME OF DAY - The current time is displayed in hours and minutes.

Auxiliary Group **Numeric key 6**

AUX OUTPUTS - The auxiliary outputs that have been programmed for this interval are displayed.

Interval Group **Numeric key 7**

INTERVAL # - This is the current interval number.

NEXT INTERVAL - This is the next interval in the program. If the current interval has been programmed to loop, the target interval will be shown. Otherwise, the next interval is the successive interval number.

Loop Group **Numeric 8**

LOOPS TO GO - If the current interval is within a loop, the loops remaining to be completed will be shown. With nested loops, only the innermost loop is available for display.

NUMBER OF LOOPS - If the current interval is inside a loop, the number of loops which have been programmed will be shown.

Program # Group **Numeric key 9**

PROGRAM # - The number for the program being run will be shown.

HOW TO EDIT VALUES WHILE RUNNING A PROGRAM

The values shown below can be edited while the 4100 is in the stop mode, or the program hold mode. To edit the values in a program, follow this procedure:

1. Select the value to be changed. See below.
2. Press the **EDIT** key to change the value being displayed.
3. If the value selected can be edited from the current mode, the EDIT light illuminates.
4. Press the appropriate numeric key(s) for inserting the new value. Press the **ENTER** key when complete.
5. The edited values are changed in the current interval only. The program memory has not been changed.

Display Value	Program Mode	
LOOPS TO GO	Stop Program Hold	This is the number of loops to be completed. For nested loops, only the inner most loop can be edited.
FINAL VALUE	Stop Hold	The final value for each channel can be changed. This new value will become the initial value for the next interval.

REMAINING TIME	Program Hold	The time remaining in the current interval can be changed.
RAMP	Stop Program Hold	If a ramp has been programmed for the channel, that ramp can be edited.
AUX OUTPUTS	Stop Program Hold	The auxiliary outputs can be changed for the current interval. Press the **CLEAR** key to cancel all the auxiliary outputs.
INTERVAL TIME	Stop Program Hold	If an interval time has been programmed for the channel, that interval time can be edited.
TIME	Stop	The time clock can be set by changing the time of day.
DATE	Stop	The date can be changed or set.

HOW TO LOCK THE KEYBOARD

The keyboard can be locked to provide security. The keyboard can be locked in either the stop mode, the program run/hold mode, the manual run mode, or the delayed start mode.

To lock the keyboard, follow this procedure:

1. If the alpha display reads CHANGE LOCK?, omit Step 2.

2. If the keyboard is to be locked from the STOP mode, follow this procedure:

   a. Press the **CONF** key. The alpha display shows CONFIGURE MODE for one second. The alpha display then shows ENTER PASSWORD.

   b. Press the appropriate numeric key(s) for the password. Press the **ENTER** key. The alpha display shows CHANGE PASSWORD?.

   c. Press the **NO** key. The alpha display shows DELETE PROGRAM.

   d. Press the **NO** key. The alpha display shows SET TEMP SCALE.

   e. Press the **NO** key. The alpha display shows CHANGE LOCK?

3. To display the current condition of the keyboard, press the **YES** key.

4. To display the alternate condition, press the **CLEAR** key.

5. When the desired condition is displayed, press the **ENTER** key. The alpha display shows SET DATE?.

6. To set the date, see Pages 8 and 9, **How to Set the Date and Time.**

7. If the 4100 does not need to have the date and time set, press the **NO** key.

To unlock the keyboard, repeat Steps 1 through 5 given above.

8. If the keyboard is to be locked from other modes than STOP.

    a. Press the **CONF** key. The alpha display shows KEYS UNLOCKED. Press the appropriate numeric key(s) for the password.

To unlock the keyboard repeat Step 8.

HOW TO CALIBRATE THE 4100

⚠ **CAUTION: Calibration of the 4100 must be done by personnel having training in the use of a voltmeter and an oscilloscope.**

⚠ **CAUTION: Make calibrations according to the specifications given in this manual.**

EQUIPMENT NEEDED:

Digital voltmeter with .001 volts resolution
Oscilloscope

To calibrate the digital analog outputs, follow this procedure:

NOTE: .Channel 1, Channel 2, and Channel 3 outputs are identical. Adjustments for Channel 2 and Channel 3 are given in parenthesis.

1. Disable the heaters, the cooling, and other controlled devices on the chamber.

2. If the alpha display reads CALIBRATE?, omit Step 3.

3. If calibration is to be done from the STOP mode, follow this procedure:

   a. Press the **CONF** key. The alpha display shows CONFIGURE MODE for one second. The alpha display then shows ENTER PASSWORD.

   b. Press the appropriate numeric key(s) for the password. Press the **ENTER** key. The alpha display shows CHANGE PASSWORD?.

   c. Press the **NO** key. The alpha display shows DELETE PROGRAM?.

   d. Press the **NO** key. The alpha display shows SET TEMP SCALE?.

   e. Press the **NO** key. The alpha display shows CHANGE LOCK?.

f. Press the **NO** key. The alpha display shows SET DATE?.

g. Press the **NO** key. The alpha display shows SET DATE?.

h. Press the **NO** key. The alpha display shows CALIBRATE?.

4. Press the **YES** key. The alpha display reads CALIBRATE LOW. The numeric display reads 1.0.

5. Locate the display module on the back of the 4100.

   a. If the 4100 is in a console, go to the back of the console. Partially remove the two screws that hold the door to the console. Open the door.

CAUTION: To prevent damage to the 4100, support the 4100 while removing the last screw. Slowly move the 4100 from the console. Do not pull the wiring.

   b. If the 4100 is on a chamber, remove five of the six screws, from the front of the 4100. Support the 4100 while removing the last screw. The wiring for the 4100 has approximately one foot of slack. Do not pull the wiring.

   c. If the 4100 is in its own box on the chamber, open the door.

6. Attach a voltmeter lead to terminal TB6 for Channel 1 on the display module. (TB-5 for Channel 2, TB-4 for Channel 3.) See Figure 5. The voltmeter display should read 1.000.

7. If the voltmeter does not read 1.000, adjust R10 on the display module to 1.000 volts (R9 for Channel 2, R8 for Channel 3.) See Figure 5.

8. Press the **YES** key. The alpha display shows CALIBRATE HIGH. The numeric display shows 4.0.

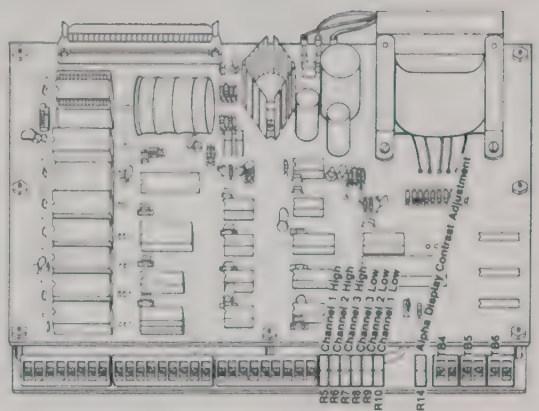


FIGURE 5

9. If the voltmeter does not read 4.000, adjust R5 on the display module to 4.000 volts (R6 for Channel 2, R7 for Channel 3.) See Figure 5.

10. Repeat Steps 4 through 8 for each channel until calibration adjustments are within ±0.01 volts.

11. Press the **STOP** key to leave the calibrate mode.

To calibrate the real time clock, follow this procedure:

1. Locate the microcomputer module on the back of the 4100.

   a. If the 4100 is in a console, go to the back of the console. Partially remove the two screws that hold the door to the console. Open the door.

CAUTION: To prevent damage to the 4100, support the 4100 while removing the last screw. Slowly move the 4100 from the console. Do not pull the wiring.

   b. If the 4100 is on a chamber, remove five of the six screws, from the front of the 4100. Support the 4100 while removing the last screw. The wiring for the 4100 has approximately one foot of slack. Do not pull the wiring.

   c. If the 4100 is in its own box on the chamber, open the door.

2. Attach a jumper wire to both ends of R6 on the microcomputer module to short it out. See Figure 6.

3. Set the oscilloscope for 0.2 volt scale. Connect the oscilloscope to Pin 10 of U10 on the microcomputer module. See Figure 6.

4. Adjust capacitor C7 on the microcomputer module for maximum amplitude of the sine wave. See Figure 6.

5. Remove the oscilloscope leads and the jumper wire from the microcomputer module.

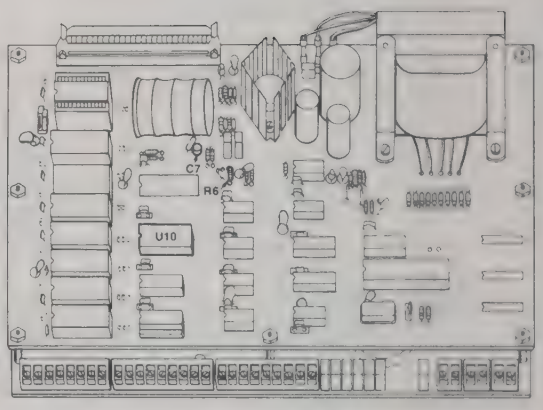


FIGURE 6

HOW TO REPLACE THE EEROM

CAUTION: Do not operate this instrument unless it is completely assembled.

The 4100 Programmer uses an EEROM (memory) for non-volatile program storage. The EEROM can be removed and saved for future use. When the space on an EEROM is full, either delete a program to create available space or replace the EEROM.

To replace the EEROM, follow this procedure:

1. Make sure the programmer is in the STOP mode.

2. Locate the microcomputer module on the back of the 4100.

   a. If the 4100 is in a console, go to the back of the console. Partially remove the two screws that hold the door to the console. Open the door.

CAUTION: To prevent damage to the 4100, support the 4100 while removing the last screw. Slowly move the 4100 from the console. Do not pull the wiring.

   b. If the 4100 is on a chamber, remove five of the six screws, from the front of the 4100. Support the 4100 while removing the last screw. The wiring for the 4100 has approximately one foot of slack. Do not pull the wiring.

   c. If the 4100 is in its own box on the chamber, open the door.

3. Use an IC remover tool to remove the EEROM (U1) from the microcomputer module. See Figure 7.

4. Insert a new EEROM. A pre-programmed EEROM can also be used.

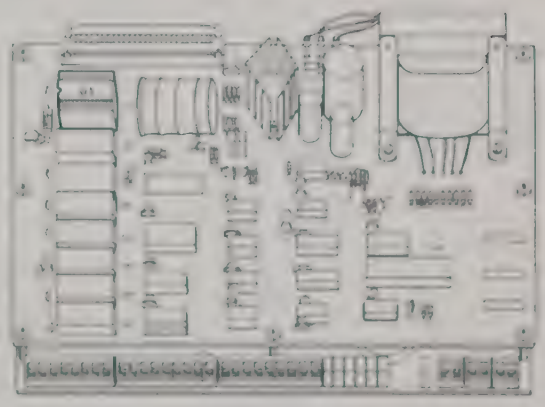


FIGURE 7

THE TERMINAL BLOCK CONNECTIONS

WARNING: Always use an electrical supply with a separate electrical ground conductor. For maximum protection against electrical shock, use a circuit that is protected by a ground fault circuit interrupt.

WARNING: To prevent electrical shock, do not touch the transformer and power terminals on the main board.

CAUTION: To prevent damage to the instrument, do not connect AC power to the terminal blocks.

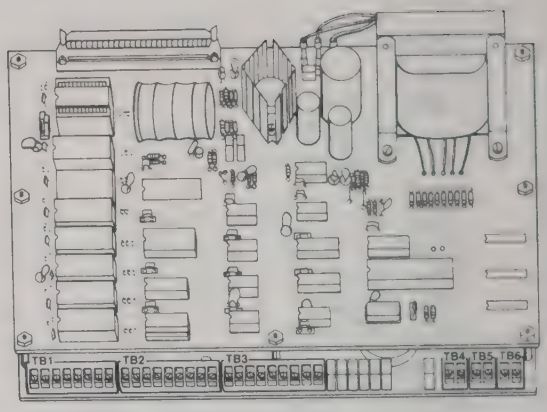


FIGURE 8

See Figure 8 for terminal block locations.

TB1	**STATE OUT**	**(Active High)**
1	Stop	
2	Configure	
3	Program	
4	Edit	
5	Not Used	
6	Hold	
7	Run	
8	Common	

TB2	**AUXILIARY OUT**	**(Active High)**
1	Aux 1	
2	Aux 2	
3	Aux 3	
4	Aux 4	
5	Aux 5	
6	Aux 6	
7	Aux 7	
8	Aux 8	
9	Common	

TB3	**AUXILIARY INPUT**	**(Active Low)**
1	Stop	
2	Run	
3	Hold	
4	Restart	
5-8	Not Used	
9	Common	

TB4 SETPOINT OUTPUT TERMINAL

Chan3	Output for Channel 3
COM	Common for Channel 3

TB5 SETPOINT OUTPUT TERMINAL

Chan2	Output for Channel 2
COM	Common for Channel 2

TB6 SETPOINT OUTPUT TERMINAL

Chan1	Output for Channel 1
COM	Common for Channel 1

Keep your Thermotron equipment at top efficiency with our preventive maintenance program.

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- Improved use of funds with less of your money invested in spare parts inventory.
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